

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	10/575,030	§ Confirmation No.:	5940
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Applicant:	Younes Jalali	§ TC/A.U.:	2123
		§	
Filed:	12/19/2006	§ Examiner:	Mary C. Jacob
		§	
Title:	System And Method For Determining Flow Rates In A Well	§ Docket No.:	SHL.0423US (103.0009)
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Mail Stop Appeal Brief-Patents

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY BRIEF

Sir:

The following sets forth Appellant's Reply to the Examiner's Answer dated April 12, 2011.

A. REPLY TO EXAMINER'S ANSWER REGARDING THE § 102 REJECTION OF CLAIMS 1-7

The Appeal Brief set forth detailed reasons regarding why the § 102 rejection of claim 1 is clearly erroneous. Specifically, contrary to the Examiner's allegation, Shah fails to disclose at least the following element of claim 1:

inverting, by a computer, the measured temperatures by applying the model to determine an allocation of production rates from different producing zones in the well, wherein **the inverting comprises using an optimization algorithm that solves an optimization problem for calculating the production rates, where the optimization problem minimizes an error between the measured temperatures and corresponding temperatures calculated by the model.**

As purportedly disclosing the foregoing bolded subject matter of claim 1, the Final Office Action cited the following passages of Shah: Fig. 3 (elements 108, 110, 112); ¶ [0006], lines 5-8; ¶¶ [0037]-[0038]. Examiner's Answer at 6-7.

The cited passage in ¶ [0006] of Shah states that flow rates are estimated by iteratively comparing measured static and transient well conditions with a model. However, there is no hint here regarding an optimization problem that **minimizes** an error between measured temperatures and corresponding temperatures calculated by a model.

The Examiner agreed that ¶ [0006] does not disclose the foregoing subject matter of claim 1. Specifically, the Examiner conceded that ¶ [0006] does not disclose “minimizing the error between the measured and calculated temperatures.” *Id.* at 33. Instead, the Examiner stated that the Examiner cited ¶ [0006] “as background information.” *Id.*

However, the Examiner continues to insist that ¶¶ [0037]-[0038] and Fig. 3 of Shah disclose an optimization problem that minimizes an error between the measured temperatures and corresponding temperatures calculated by the model. *Id.* The Examiner's Answer argued that “[i]t is the Examiner's position that Shah's disclosure of making changes to the model such that the model more closely estimates the actual measured quantities is equivalent to the ‘minimizing’ referred to by the Appellant.” *Id.* at 34. This allegation is clearly unsupported. A model that “more closely estimates” the actual measured quantities is clearly not the same as an optimization problem that **minimizes** an error between measured temperatures and corresponding temperatures calculated by a model. Equating “more closely” with “minimize” constitutes clear error.

As discussed in the Appeal Brief, the process of Shah, as depicted in Fig. 3 and described in ¶¶ [0037]-[0038], performs modeling comparisons that are reiterated until an **approximate**

match within **acceptable** tolerances is obtained between calculated well properties and measured well properties. Performing modeling comparisons to approximately match calculated well properties and measured well properties is clearly not the same as using an optimization algorithm that solves an optimization problem, where the optimization problem minimizes an error between the measured temperatures and corresponding temperatures calculated by the model.

Shah also discloses that its process reiterates until the deviation between measured and model-calculated quantities are approximately “good enough,” *i.e.*, to within **acceptable** tolerances. Again, this provides no hint of the optimization problem that **minimizes** an error, as claimed. It is clear that approximately matching or approximating until the deviation is “good enough” is clearly different from the optimization problem minimizes an error between the measured temperatures and corresponding temperatures calculated by the model.

In view of the foregoing and in view of the arguments presented in the Appeal Brief, it is clear that Shah does not disclose the subject matter of claim 1, and thus, the rejection of claim 1 and its dependent claims is clearly erroneous.

B. REPLY TO EXAMINER’S ANSWER REGARDING THE § 102 REJECTION OF CLAIMS 12-15

The Appeal Brief set forth detailed reasons regarding why Shah fails to disclose at least the following subject matter of independent claim 12: measuring a total flow rate from the well, where determining flow rates comprises inverting the measured temperatures by applying a model, where the inverting comprises allocating the total flow rate among the plurality of well zones.

The Response to Arguments section of the Examiner’s Answer argued that ¶ [0038] of Shah provides an estimate of phase flow rates at each well entry point. 04/12/2011 Office

Action at 35. As explained in ¶ [0038] of Shah, deviation between the calculated and measured quantities are used with sensitivity coefficients of a model to determine changes necessary for the estimate of phase flow rates at each well entry point. The modeling comparisons are reiterated until an approximate match is obtained between the calculated well properties and related flow rates and the measured well properties and flow rates. Shah, ¶ [0038]. Contrary to the allegation by the Examiner, ¶ [0038] does not disclose determining flow rates that comprises inverting the measured temperatures by applying a model, where the inverting comprises **allocating the total flow rate among the plurality of well zones.**

Although ¶ [0041] of Shah refers to providing a wellhead flow rate to the model of Shah, there is no hint in ¶ [0041] or in ¶¶ [0037]-[0038] of Shah, regarding applying the model that comprises **allocating** a total flow rate **among** a plurality of well zones.

In view of the foregoing and in view of the arguments presented in the Appeal Brief, it is clear that claim 12 and its dependent claims are allowable over Shah.

C. REPLY TO EXAMINER'S ANSWER REGARDING THE § 103 REJECTION OF CLAIM 8 OVER SHAH IN VIEW OF FINSTERLE

The Appeal Brief set forth detailed reasons regarding why claim 8 is non-obvious over Shah and Finsterle.

Claim 8 further recites:

wherein determining the degree of certainty comprises determining a degree of error in the model, the method further comprising compensating for the determined degree of error in the model in performing the inverting.

The Examiner cited Finsterle as purportedly disclosing the claimed subject matter of claim 8 conceded by the Examiner to be missing from Shah.

Appellant respectfully disagrees. Page 2, ¶ 2, of Finsterle explains that errors in the conceptual model can have large impact on model predictions. According to Finsterle, the

“ultimate goal is to assess the best model and its parameters for predicting the behavior of a dynamic flow system.” Finsterle, p. 3, ¶ 1. As further explained in Finsterle, the models are calibrated to laboratory or field data. *Id.*, p. 4, ¶ 1. Page 7, § (4) of Finsterle states that the model output and measured data are compared only at the discrete points in space and time, which are the so-called calibration points. The purpose of performing such comparison in Finsterle is to **iteratively update the model parameters**, such that an optimal model is produced. *Id.*, p. 8, § (8).

The goal in Finsterle of iteratively updating a model based on comparing model output and measured data, is different from the subject matter of claim 8. According to claim 8, a degree of certainty is determined in the production rates allocated (based on application of the model), where the degree of certainty includes a degree of error in the model. Thus, according to claim 8, some error is assumed to be present in the model. Claim 8 further recites that such determined degree of error in a model is **compensated** for in performing the inverting. Since the model of Finsterle has been iteratively updated based on measured data to be in a form acceptable to an operator, it is clear that Finsterle would **not** perform any compensating for a determined degree of error in the model in performing the inverting, since the operator would assume that such error in the model does not exist.

The Response to Arguments section of the Examiner’s Answer pointed to equation 1.5.3 of Finsterle as purportedly being the determined degree of error in the model that is recited in claim 8. Examiner’s Answer at 40. Equation 1.5.3 of Finsterle refers to a residual vector that is calculated based on differences between the measured and calculated system responses at calibration points. Finsterle, page 7, item (4). Computing differences between the measured and calculated system responses, as disclosed by Finsterle, provides no hint of determining a degree

of error **in the model**, in combination with compensating for the determined degree of error in the model in performing the inverting.

For reasons set forth above and in the Appeal Brief, it is respectfully submitted that claim 8 is clearly non-obvious over Shah and Finsterle.

D. CONCLUSION

The remaining arguments presented in the Examiner's Answer have either been rebutted above or addressed in the Appeal Brief. In view of the foregoing, and in view of the Appeal Brief, reversal of all final rejections is respectfully requested.

Respectfully submitted,

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